

IN THE CLAIMS:

Claims 1-8 (Cancelled)

9. (Original) A process for the production of dimethyl ether, comprising the steps of:

(a) mixing a gas feed, containing a lower hydrocarbon having 1-4 carbon atoms and 30-70 mole % of CO₂ based on a total mole of the CO₂ and the lower hydrocarbon, with H₂O to obtain a mixed gas having contents of the CO₂, H₂O and lower hydrocarbon satisfying the following condition:

$$0.5 \leq ([\text{CO}_2] + [\text{H}_2\text{O}])/[\text{C}] \leq 2.5$$

wherein [CO₂] represents the moles of the CO₂, [H₂O] represents the moles of the H₂O and [C] represents the moles of carbon of the lower hydrocarbon;

(b) contacting said mixed gas with a catalyst at a temperature of 600-1,000°C and a pressure of 10-75 atm to produce a synthesis gas with a synthesis gas production efficiency Yf of at least 80 % and a carbon conversion efficiency Cf of at least 50 %,

said synthesis gas production efficiency Yf being represented by the following formula:

$$Yf = \{[\text{CO}] + [\text{H}_2]\}/([\text{C}] + [\text{CO}_2] + [\text{H}_2\text{O}]) \times 100 \%$$

wherein [CO] represents the moles of CO in said synthesis gas, [H₂] represents the moles of H₂ in said synthesis gas, and [CO₂], [H₂O] and [C] are as defined previously,

said carbon conversion efficiency Cf being represented by the following formula:

$$Cf = \{[\text{CO}]/([\text{C}] + [\text{CO}_2])\} \times 100 \%$$

wherein [CO], [CO₂] and [C] are as defined previously,

said synthesis gas having a molar ratio of hydrogen to carbon monoxide of 0.5-1.5,

said catalyst having a specific surface area of 5 m²/g or less and comprising a magnesium oxide-containing carrier and at least one catalytic metal selected from the group consisting of rhodium and ruthenium and supported on said carrier in an amount of 10-5,000 ppm, in terms of elemental metal, based on the weight of said carrier;

(c) reacting said synthesis gas in the presence of one or more catalysts having activities of methanol synthesis, methanol dehydration and CO shift reaction to obtain a product containing dimethyl ether; and

(d) separating said dimethyl ether from said product.

10. (Original) A process as claimed in claim 9, wherein said gas feed contains 40-60 mole % of CO₂ and wherein said mixed gas satisfies the following condition:

$$1 \leq ([\text{CO}_2] + [\text{H}_2\text{O}])/[\text{C}] \leq 2$$

wherein [CO₂], [H₂O] and [C] are as defined in claim 9.

11. (Original) A process as claimed in claim 9, wherein said gas feed is discharged overhead from a distillation tower where a raw material feed containing CO₂ and a lower hydrocarbon is distilled at a pressure of 10-80 atm while removing CO₂ from a bottom thereof.

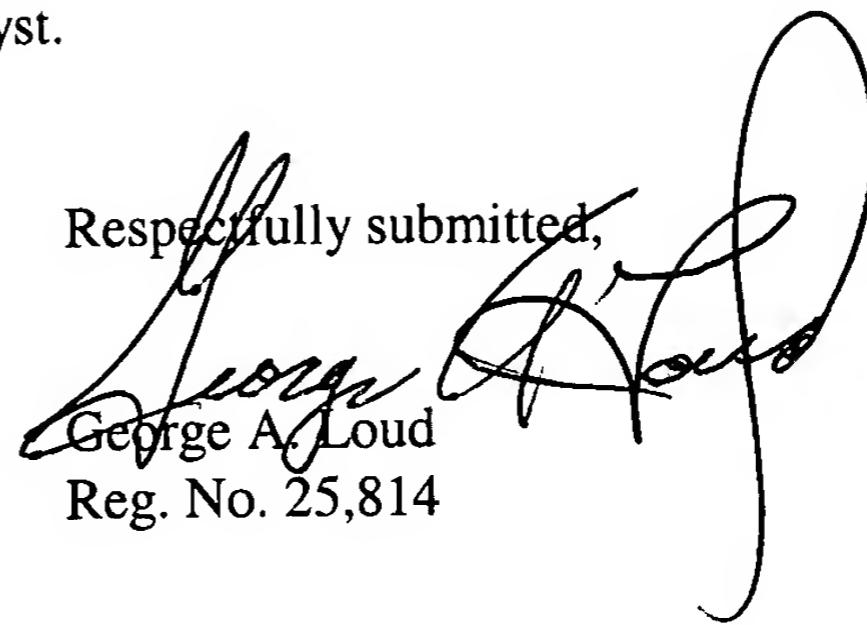
12. (Original) A process as claimed in claim 11, wherein said distillation tower is operated at a pressure of 20-50 atm and a tower top temperature of -60°C.

13. (Original) A process as claimed in claim 9, wherein step (c) is performed using at least two catalysts selected from the group consisting of a methanol synthesis catalyst, a methanol

dehydration catalyst and a CO shift reaction catalyst.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "George A. Loud". The signature is fluid and cursive, with a large, stylized "G" at the beginning and a "D" at the end.

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